



**Pearson LCCI
Level 2 Business Statistics
(ASE2009)**

**Annual Qualification
Review
2014/2015**

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INTRODUCTION

The annual qualification review provides qualification-specific support and guidance to centres. This information is designed to help teachers preparing to teach the subject and to help candidates preparing to take the examination.

The reviews are published in September and take into account candidate performance, demonstrated in both on demand and series examinations, over the preceding 12 months. Global pass rates are published so you can measure the performance of your centre against these.

The review identifies candidate strengths and weaknesses by syllabus topic area and provides examples of good and poorer candidate responses. It should therefore be read in conjunction with details of the structure and learning objectives contained within the syllabus for this qualification found on the website.

The review also identifies any actual or proposed changes to the syllabus or question types together with their implications.

PASS RATE STATISTICS

The following statistics are based on the performance of candidates who sat this qualification between 1 October 2014 and 31 August 2015.

Global pass rate 57.8%

Grade distributions of candidates achieving pass or higher

Pass 19.6%

Merit 24.9%

Distinction 13.3%

* This figure excludes absences on the day of the exam

GENERAL STRENGTHS AND WEAKNESSES

General strengths and weaknesses

Strengths

- Many key areas of the specification were well understood. These included topics such as measures of location and dispersion, regression and time series analysis.
- Part questions requiring application of a set of routines or procedures were popular and again answered to a satisfactory standard.
- Most candidates were able to attempt the required 4 questions.
- In general there was evidence of a clear and systematic method seen enabling follow through marks to be awarded, where appropriate.
- Graphs/diagrams were normally selected and drawn, in part, correctly.
- Appropriate use was made of calculators.

Weaknesses

- Key areas of the specification, such as data collection, sampling methods, index numbers and probability continued to show evidence of a lack of real knowledge and understanding.
- Candidates experienced difficulties in answering questions requiring interpretation, comment or inference.
- Gaps in knowledge were evident as a number of part questions were often ignored.
- Levels of accuracy remained an issue as many candidates were tempted to use approximations, premature rounding's and not define units used in their final answer.
- A number still had problems in drawing graphs /diagrams accurately. Scales were often poorly constructed, points plotted incorrectly and errors made in reading off values from their graphs.

TEACHING POINTS BY SYLLABUS TOPIC

Section 1.1 Graphical presentation

This section aims to review different methods of data presentation, focusing on the selection of appropriate charts/diagrams, correct and accurate drawing of these charts/diagrams and interpretation of the presentations shown.

Q6 a-b

In general the presentations were appropriate with 2 separate bar charts drawn. However in certain cases the raw data was plotted in cumulative form rather than the cumulative % values and in other incorrect examples multiple bar charts were drawn, showing each region as a separate block. The part question requiring interpretation of the chart often did not pick up on the % changes in regional sales but rather focussed on data given in the original table.

Section 1.2 Survey methodology

This section deals with survey methodology and requires an in depth understanding of data sources, sample design and data collection methods.

Q6 c-f

Answers on this part were of a poor standard. Many could not explain the concept of a sampling frame or how to select a systematic sample. Whilst most understood how to choose a proportionate stratified sample, few were able to give two reasons why this might be a suitable sampling method to use in this case. Too many, for example, referenced bias in their answer rather than the need to select a representative sample. Again the part question on data collection methods was not well answered. Many were only able to give one advantage and one disadvantage for conducting a survey using emails rather than other data collection methods.

Section 2.1. & 2.3 Measures of location and dispersion – grouped data & Coefficient of Variation

This part deals with summarising data using suitable measures of location and dispersion. As these questions were mainly technique or graph based the standard of answers was good whether the data had been presented in grouped or ungrouped form.

Q5 a-b

Most were able to calculate the 3 measures of location and dispersion in part (b). A number did however, confuse the method for calculating the mean deviation with that required to estimate the standard deviation. Few understood the effect that adding a constant to each value in the data set would have on the values for the mean and standard deviation.

Q4

Most drew the ogive correctly although a number plotted the cumulative frequency against either the lower limit or mid-point of the variable. In general the readings required in parts (b) and (c) were correct but a number lost accuracy marks at this stage due either to poor scaling on the ogive or inaccuracies with the plotted points. In most cases the mean was correctly estimated with appropriate use made of the mid-points. The only errors were the divisor used for Σfx being 6 rather than 150. Comments in part (e) were often vague or incomplete with little statistical basis. Few mentioned, for example, that the median was not affected by extreme items in the data. Most were unable to provide an answer to the assumption made when estimating the mean using class mid-points i.e. that the values were evenly spread across the class interval.

Section 2.4 Index numbers

The aim of this section is to introduce time dependent statistical analysis based on the use of Index numbers.

Q1 a-c

Few mentioned why it is necessary to change the base year periodically. Whilst many rebased the RPI correctly to 2009 only a small number were then able in part (c)(i) to use these indices to recalculate average earnings at 2009 prices. Comments on the trend in part(c) (ii) were generally correct on follow through. A number had difficulty in part (c) (iii), normally arriving at an answer based on the following, $420 \times (213.7/256.1)$.

Section 3.1 Correlative and regression

This section is designed to provide an understanding of regression and correlation analysis.

Q1 d

There were a number of errors in this part mainly due to either incorrect ranks (including tied ranks) or mistakes in the use of the formula with a numerator based on $1 - 6\Sigma d^2$. The interpretation normally did not reference the context, often simply stating positive correlation.

Q3 a-e

A number of errors occurred in the calculation of the regression equation often due to candidates exchanging the x and y headings. This happened despite the headings being given in the table. Few could define, in context, either 'a' the intercept (fixed maintenance cost) or 'b' the slope (the increase in maintenance cost for each additional 1000km travelled). Interpolation and extrapolation were correctly defined in parts (c(ii) and d). Most candidates did not attempt part (e) failing to recognise the alternative x on y line.

Section 3.2 Time series

This section focuses on developing techniques available to analyse time related data.

Q2 a-c

A number failed to use the correct order of moving average (7) with many attempting to apply a 5-point average or in some cases a 4-point followed by a 2-point moving average. There was often a lack of care shown in the plotting of both the original data and the moving averages. The latter were often started at Monday of week 1 whilst both sets of points were frequently not linked by straight lines. Interpretation was poor, for example, few understood that the Monday index of -16.2 implied actual sales were 16200 litres lower than the predicted or trend figure. Also most were unable to provide a suitable explanation in part (c) why the sales may be higher on that particular day than expected.

Section 4 Uncertainty

This part deals with the analysis of risk and uncertainty in Statistics and involves an understanding of the basic concepts and rules of probability.

Q5 c

Few were able to draw a correct tree diagram and as such had difficulty in identifying the appropriate outcomes. In general there were misunderstandings regarding the use of addition and multiplication rules and the concept of conditional probability. As such this particular part was not well answered.

Further guidance

- Much greater emphasis needs to be placed on certain key areas of the specification such as Sections 1.2 (sampling and data collection methods) and Section 2.4 (index numbers).
- It is important to stress that all key parts of the specification need to be addressed.
- More attention needs to be paid to interpretation, inference and appreciation of the uses and limitations of statistical analysis in a business context
- Probability concepts and methods including addition/ multiplication rules, conditional probability and the listing of outcomes using Venn and tree diagrams need to be more fully discussed.
- Graphs/diagrams need some improvement in terms of presentation, accurate plotting of points and scaling. Additionally candidates need to have a better understanding of the different uses for each of the alternative forms of presentation available.
- Accuracy levels should be addressed as there is much evidence of the use of rounding's and premature approximations or, if calculators are used, answers expressed to an excessive degree of accuracy.
- More care should be taken in the layout of answers to enable a clear method to be seen which can then allow for follow through marks to be awarded in the event of errors being made at an earlier stage in the solution.

EXAMPLES OF CANDIDATE RESPONSES

Series 3 2015 – Question 1

1 (a) Explain why, at times, it is necessary to change the base year of an inflation index. (2)

The Retail Price Index and the average earnings, per week, of full-time staff working for a chain of supermarkets from 2009 to 2014 are given in the table below.

Year	Retail Price Index (Jan 1987 = 100)	Average earnings of supermarket staff (£ per week)
2009	213.7	420
2010	223.6	435
2011	235.2	445
2012	242.7	450
2013	250.1	460
2014	256.1	475

(Source: Office for National Statistics)

(b) (i) Calculate a revised Retail Price Index for each year from 2009 to 2014, using 2009 as the base year. (4)

(ii) State the percentage increase in retail prices between 2009 and 2014. (1)

(c) (i) Calculate the average earnings of supermarket staff at 2009 prices, for each year from 2009 to 2014. (3)

(ii) Describe the trend in real earnings of supermarket staff over the period 2009 to 2014. (2)

(iii) Calculate the average weekly earnings of full-time staff in 2014 that would be worth the same as the £420 average weekly earnings in 2009. (2)

LOW RESPONSE:

Examiners Response

Part (a) reference to change over time; implied up date; no reference to comparisons over time. [1 mark]

(b)(i) attempt to use Laspeyre incorrectly. [0 mark]

(b)(ii) comment of no value. [0 mark]

(c)(i) incorrect method. [0 mark]

(c)(ii/iii) not attempted. [0 mark]

(d)(i/ii) error on rankings but tie correct; method and accuracy follow through for Σd^2 [2 marks]

: method and accuracy follow through for rank correlation coefficient . [4 marks]

(d)(iii) one mark for reference positive correlation; no context [1 mark]

TOTAL 8 MARKS

Question 1

1a) It is necessary to change the base year of an inflation index because weight and commodities changes over time. ✓

b) i) Laspeyres price index $\frac{\sum P_1 Q_0}{\sum P_0 Q_0}$

Year	P_0	Q_0	
2009	213.7	420	89,754
2010	235.6	435	97,266
2011	235.2	445	104,664
2012	242.7	450	109,215
2013	250.1	460	115,046
2014	256.1	475	121,647.5
Σ	1,421.40	2,685	637,592.50

ii) Laspeyres index = $\frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100$
 $= \frac{3816459}{637592.50} \times 100$
 $= 598.60$ X O

ii) The Laspeyres price index use base year quantity as weight. X O

c) i)

Year	Retail price index	Retail price index (2009)
2009	213.7	$\frac{213.7}{213.7} \times 100 = 1$

X O

(Question)

d)	Supermarket	Size rank	sales (£000)	Ranking X	Ranking Y	d	d ²
	A	6	76	6	7	-1	1
	B	4	62	4	3	1	1
	C	9	74	9	6.5	2.5	6.25
	D	2	39	2	1	1	1
	E	3	64	3	4	-1	1
	F	7	74	7	6.5	0.5	0.25
	G	10	94	10	9	1	1
	H	5	67	5	5	0	0
	I	1	59	1	2	-1	1
	J	8	79	8	8	0	0
	Total		688				12.5

d) ii) Spearman's rank correlation coefficient = $1 - \frac{6 \sum d^2}{n(n^2-1)}$

$$= 1 - \frac{6(12.5)}{10(100-1)}$$

$$= 1 - \frac{75}{999}$$

$$= 1 - 0.08$$

$$= 0.92$$

ii) ∴ The value of Spearman's rank correlation coefficient between the two sets of ranks is 0.92. It is a strong positive correlation.

iii) ~~The value of Spearman's rank correlation coefficient~~

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MEDIUM RESONSE:

Examiners Response

- Part (a) references series up to date; no comment on comparisons. [1 mark]
 (b)(i) fully correct. [4 marks]
 (b)(ii) incorrect calculation of increase. [0 mark]
 (c)(i) fully correct [3 marks]
 (c)(ii) not attempted [0 mark]
 (c)(iii) not attempted [0 mark]
 (d) (i/ii) rankings correct [3 marks]
 method and accuracy follow through for d²; method and accuracy follow through for rank correlation coefficient . [4 marks]
 (d)(iii) one mark only for strong positive comment ; context not referenced [1 mark]

TOTAL 16 MARKS

Question 1
 a) 1) to update data ✓
 2) ✓

Year	Retail Price Index (2009 = 100)
2009	$\frac{213.7}{213.7} \times 100 = 100$
2010	
2011	
2012	
2013	
2014	

bi)

Year	Retail Price Index (1987 = 100)	Retail Price Index ²⁰⁰⁹ (2009 = 100)
2009	213.7	$\frac{213.7}{213.7} \times 100 = 100$
2010	222.6	$\frac{222.6}{213.7} \times 100 = 104.63$
2011	235.2	$\frac{235.2}{213.7} \times 100 = 110.06$
2012	242.7	$\frac{242.7}{213.7} \times 100 = 113.57$
2013	250.1	$\frac{250.1}{213.7} \times 100 = 117.03$
2014	256.1	$\frac{256.1}{213.7} \times 100 = 119.84$

ii) ~~119.84~~
~~119.84~~

Year 2009 ~ 2014 (Percentage increase in Retail Price)

$$\frac{119.84 - 100}{100} \times 100\%$$

$$= 19.84\%$$

d) i).

Supermarket	Size Rank (X)	Sales (Euros) (Y)	Ranking X	Ranking Y	d	d ²
A	6	76	6	8	-2	4
B	4	62	4	3	+1	1
C	9	74	9	6.5	2.5	6.25
D	5	39	2	1	4	16
E	3	61	3	4	-1	1
F	7	74	7	6.5	0.5	0.25
G	10	94	10	10	0	0
H	5	67	5	5	0	0
I	1	59	1	2	-1	1
J	8	79	8	9	-1	1
Total:	-	-	-	-	-	23.5

ii) Spearman's Rank Correlation Coefficient.

$$r_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

$$= 1 - \frac{6(23.5)}{10(10^2 - 1)}$$

$$= 1 - \frac{141}{990}$$

$$= 0.86$$

iii) When the Spearman's rank correlation coefficient = 0.86, there are strong positive correlation between size rank and sales.

c) i) $\text{Average Earnings} = \frac{\text{Nominal Wages}}{\text{Retail Price Index}}$

Year	Year	Average Earnings	Average Earnings
2009	2009	430	$\frac{430}{100} \times 100 = 430$
2010	2010	435	$\frac{435}{104.63} \times 100 = 415.75$
2011	2011	440 445	$\frac{445}{110.06} \times 100 = 404.32$ ✓
2012	2012	450	$\frac{450}{113.57} \times 100 = 396.23$
2013	2013	460	$\frac{460}{117.03} \times 100 = 392.73$
2014	2014	475	$\frac{475}{119.88} \times 100 = 396.32$ ✓

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HIGH RESPONSE

Examiner Response

HIGH RESPONSE: Script 1

Part (a) implied bringing information up to date: no reference to comparison of prices [1 mark]

(b)(i) fully correct [4 marks]

(b)(ii) fully correct [1 mark]

(c)(i) fully correct [3 marks]

(c)(ii) trend in earnings correctly explained [2 marks]

(c)(iii) incorrect method used [0 mark]

(d)(i/ii) rankings including ties correct: [3 marks]

rank coefficient correct [6 marks]

(d)(iii) positive relationship: context not referenced. [1 mark]

TOTAL 21 MARKS

Question 1

1. (a) It is ~~not~~ necessary to change the base year of an inflation index because weights and commodity changes over time.

(b)(i)	Year	Retail Price Index (Jan 1987=100)	Retail Price Index (Jan 2009=100)
	2009	213.7	$\frac{213.7}{213.7} \times 100 = 100$
	2010	223.6	$\frac{223.6}{213.7} \times 100 = 104.63$
	2011	235.2	$\frac{235.2}{213.7} \times 100 = 110.06$ ✓
	2012	242.7	$\frac{242.7}{213.7} \times 100 = 113.57$ ✓
	2013	250.1	$\frac{250.1}{213.7} \times 100 = 117.03$ ✓
	2014	256.1	$\frac{256.1}{213.7} \times 100 = 119.84$ ✓

(ii) The percentage increase in retail price between 2009 and 2014
 $= \frac{119.84 - 100}{100} \times 100\%$
 $= 19.84\%$

(c) (i)	Year	Retail Price Index (Jan 2009=100)	Average earnings of supermarket staff (£ per week)	Real average earnings of supermarket staff (£ per week)
	2009	100	420	$\frac{420}{100} \times 100 = 420$
	2010	104.63	435	$\frac{435}{104.63} \times 100 = 415.75$
	2011	110.06	445	$\frac{445}{110.06} \times 100 = 404.32$
	2012	113.57	450	$\frac{450}{113.57} \times 100 = 396.23$
	2013	117.03	460	$\frac{460}{117.03} \times 100 = 393.06$ ✓
	2014	119.84	475	$\frac{475}{119.84} \times 100 = 396.36$ ✓

(21) (ii) The real earnings of supermarket staff over the period 2009 to 2013 had decreased.
 The real earnings of supermarket staff over the period 2013 to 2014 had increased.

(iii) The average weekly earnings of full-time staff
 $= \frac{\text{Nominal wages}}{\text{Retail Price Index}} \times 100$
 $= \frac{£420}{119.84} \times 100$
 $= £350.47$

(d)(i)	Supermarket	Size rank	Sales (£000)	Ranking X	Ranking Y	d	d ²
	A	6	76	6	8	(2)	4
	B	4	62	4	3	1	1
	C	9	74	9	6.5	2.5	6.25
	D	2	39	2	1	1	1
	E	3	64	3	4	(1)	1
	F	7	74	7	6.5	0.5	0.25
	G	10	94	10	10	0	0
	H	5	67	5	5	0	0
	I	1	59	1	2	(1)	1
	J	8	79	8	9	(1)	1
	Total	-	-	-	-	-	15.5

(ii) Spearman's rank correlation coefficient

$$\begin{aligned}
 r_s &= 1 - \frac{6 \sum d^2}{n(n^2-1)} \\
 &= 1 - \frac{6(15.5)}{10(10^2-1)} \\
 &= 1 - \frac{93}{990} \\
 &= 0.91
 \end{aligned}$$

(iii) The Spearman's rank correlation coefficient is 0.91, they are strong positive relationship between size rank and sales.

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